IN THE CLAIMS:

Please amend Claims 2, 3, 6, 7, 9-14, 16, 21-23, 25-29, 31, 33, 35-37, 42-46 and 48 of the PCT application as follows:

-- 2 (Amended). A method according to Claim 1, wherein the distance, occupied by the diffusing medium, between the neutron source and the exposed material is at least one order of magnitude larger than the diffusion coefficient [(*D*)] for elastic neutron scattering within the diffusing medium.

3 (Amended). A method according to Claim 1 [or 2], wherein at least the portion of the diffusing medium where the exposed material is distributed is made of heavy elements, so that multiple elastic neutron collisions result in a slowly decreasing energy of the neutrons originating from the source.

6 (Amended). A method according to Claim 4 [or 5], wherein the moderator is made of carbon or deuterated water.

7 (Amended). A method according to [any one of Claims 3 to 6] Claim 3, wherein said heavy elements are lead and/or bismuth.

9 (Amended). A method according to Claim 8, wherein the lead and/or bismuth of said central region is in liquid phase, and is circulated by natural convection along a circuit [(13-15)] including a heat exchanger and an auxiliary heater.

10 (Amended). A method according to [any one of Claims 1 to 7] Claim 1, wherein the neutron source consists of a beryllium or lithium target bombarded with a charged particle beam.

11 (Amended). A method according to [any one of Claims 1 to 7] Claim 1, wherein the neutron source is a radioactive source.

12 (Amended). A method according to [any one of Claims 1 to 7] Claim 1, wherein the neutron source consists of a spallation target bombarded with a high-energy charged particle beam.

13 (Amended). A method according to [any one of Claims 1 to 7] Claim 1, wherein the neutron source is a critical fast breeder reactor core, out of which fast neutrons leak.

14 (Amended). A method according to [any one of Claims 1 to 7] Claim 1, wherein the neutron source is an energy amplifier core comprising a spallation target and a nuclear fuel material, wherein the spallation target is bombarded by a high-energy charged particle beam to produce high-energy neutrons which initiate a sub-critical process of breeding a fissile element from a fertile element of the fuel material and fission of the fissile element, whereby fast neutrons leak out of the energy amplifier core toward the diffusing medium.

16 (Amended). A method according to Claim 14 [or 15], wherein lead and/or bismuth form both said spallation target and said neutron-diffusing medium, at least some of said lead and/or bismuth being in liquid phase and circulated along a cooling circuit to extract heat from the energy amplifier core.

21 (Amended). A method according to Claim 19 [or 20], wherein the moderator is made of carbon or deuterated water.

22 (Amended). A method according to Claim 21, wherein the moderator is made of carbon, and has a thickness [(Δr)] of the order of 5 to 10 cm.

23 (Amended). A method according to [any one of Claims 18 to 22] Claim 18, wherein said heavy elements are lead and/or bismuth.

25 (Amended). A method according to Claim 24, wherein the lead and/or bismuth of said central region is in liquid phase, and is circulated by natural convection along a circuit [(13-15)] including a heat exchanger and an auxiliary heater.

26 (Amended). A method according to [any one of Claims 17 to 23] Claim 17, wherein the neutron source consists of a beryllium or lithium target bombarded with a charged particle beam.

27 (Amended). A method according to [any one of Claims 17 to 23] Claim 17, wherein the neutron source is a radioactive source.

28 (Amended). A method according to [any one of Claims 17 to 23] Claim 23, wherein the neutron source consists of a spallation target bombarded with a high-energy charged particle beam.

29 (Amended). A method according to [any one of Claims 17 to 28] Claim 17, wherein the exposed material comprises ^{127}I as said first isotope, which produces the useful radio-isotope ^{128}I by capturing neutrons from the flux.

A7

31 (Amended). A method according to [any one of Claims 17 to 28] Claim 17, wherein the exposed material comprises ^{98}Mo as said first isotope, which produces ^{99}Mo by capturing neutrons from the flux, said ^{99}Mo being allowed to decay into the useful radio-isotope ^{99m}Tc.

A8

33 (Amended). A method according to [any one of Claims 17 to 28] Claim 17, wherein the exposed material comprises ^{130}Te as said first isotope, which produces ^{131}Te by capturing neutrons from the flux, said ^{131}Te decaying into the useful radio-isotope ^{131}I.

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35 (Amended). A method according to [any one of Claims 17 to 28] Claim 17, wherein the exposed material comprises a fissile element as said first isotope, which produces fission fragments by capturing neutrons from the flux, said useful isotope being a radio-isotope extracted from said fission fragments.

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36 (Amended). A method according to [any one of Claims 17 to 28] Claim 17, wherein the exposed material comprises ^{124}Xe as said first isotope, which produces ^{125}Xe by capturing neutrons from the flux, said ^{125}Xe decaying into the useful radio-isotope ^{125}I.

37 (Amended). A method according to [any one of Claims 17 to 28] Claim 17, wherein the exposed material comprises a semiconductor material, and the useful isotope is a doping impurity within said semiconductor material, which is obtained from neutron captures by a first isotope of the semiconductor material .

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42 (Amended). A method according to Claim 40 [or 41], wherein said transmuted isotope comprises ^{99}Tc.

43 (Amended). A method according to [any one of Claims 40 to 42] Claim 40, wherein said transmuted isotope comprises ^{129}I.

44 (Amended). A method according to [any one of Claims 40 to 43] Claim 40, wherein said transmuted isotope comprises ^{79}Se.

45 (Amended). A method according to [any one of Claims 40 to 44] Claim 40, wherein the neutron source is a critical fast breeder reactor core, out of which fast neutrons leak.

46 (Amended). A method according to [any one of Claims 40 to 44] Claim 40, wherein the neutron source is an energy amplifier core comprising a spallation target and a nuclear fuel material, wherein the spallation target is bombarded by a high-energy charged particle beam to produce high-energy neutrons which initiate a sub-critical process of breeding a fissile element from a fertile element of the fuel material and fission of the fissile element, whereby fast neutrons leak out of the energy amplifier core toward the diffusing medium.

48. A method according to Claim 46 [or 47], wherein the nuclear fuel material comprises further fissile elements consisting of actinides to be disposed of.

Respectfully submitted,

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